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DOCUMENT-IDENTIFIER: US 5218612 A

TITLE: Intelligent computer integrated maintenance system and method

Brief Summary Text (7):

The art has heretofore suggested adding a maintenance module to a computer integrated manufacturing system in order to integrate maintenance of the production machines into the computer integrated manufacturing system. For example, the Haynes et al. '772 patent noted above discloses a glassware production control system which also provides maintenance information. The Ohno et al. '634 patent noted above also describes a production process control computer which includes a materials and maintenance control subsystem. The materials and maintenance control subsystem controls the timing of parts replacement. The timing of parts replacement is calculated in advance from the cumulative total of the predicted life of consumable parts and operation time and displayed or printed so as to enable order placement for parts. The maintenance system includes a parts list file containing a list of all consumable parts in the system. The parts list file is updated by collecting information on the operation of the machine so that residual service lives of consumable parts may be calculated. When parts replacement is needed, the quantity of parts used for replacement is deducted from the stock volume in the parts inventory file. When the stock volume of parts in the parts inventory file becomes smaller than at the time of parts ordering, an order form slip is printed. In other words, a "point of ordering" system is provided. A running total of elapsed time is computed and compared with the durable life of parts so that the time and date of actual replacement can be calculated and a schedule of maintenance may thereby be derived.

Brief Summary Text (24):

The spare parts inventory management subsystem of the intelligent computer integrated maintenance system allows ordering of spare parts based on predicted maintenance, rather than on the prescribed inventory levels. Spare parts budgeting is also accommodated. According to the invention, generic parts are ordered using a conventional order point system when the inventory quantities fall below a predetermined order point. For replaceable parts, however, the parts requirements are calculated based on time phased manufacturing requirements and mean-times to failure. The automated parts manual file is used to extend the production plan to parts replacement. A requirement is generated to replace a part in the week that it will exceed its mean-time to failure, and order forms for the parts are generated, or the parts may be ordered electronically.

Detailed Description Text (32):

Replaceable parts are those which have an extended life but are subject to wear or failure. Examples include fans, motors, shafts and drives. These items have a mean-time failure rate which is initially provided by the machine vendor, who is normally the supplier of replacement parts. According to the invention, actual run hours and future run hours for these parts are determined from the master production schedule file and compared to the mean-time failure rate to determine projected parts replacement. When these parts are replaced, the actual run hours are set to zero and the accumulation cycle begins again. The replaceable part

information (including for example, complex equipment number, maintenance request number, accumulated hours and other pertinent data) is saved in a parts history file described below. Statistical analysis is applied to review the mean-time failure rate for the part in this complex. If a vendor supplied mean-time failure rate is available, it is reviewed and modified when necessary. When no vendor supplied rate is available, a historical mean-time failure rate will be calculated based on parts history information. The parts manual file also provides information on replacement parts which are still under warranty by the vendor. The vendor's warranty date and/or warranty hours are maintained for the warranty comparison.

Detailed Description Text (34):

Non-stocked parts include the machine frames, doors, and other items which are not likely to require replacement due to failure or maintenance. These items are carried in the parts manual file for reference.

Detailed Description Text (37):

It will be understood by those having skill in the art that under certain circumstances it may be necessary to procure replacement parts prior to the modification of the parts manual file. For example, in an efficiency upgrade program, replacement parts may be identified for the improvement before the sequence in which complexes are to be modified has been determined. Another example is when an improvement kit has been obtained but the engineering drawing is not yet available. In both cases "Planning Bills of Material" provide a method of identifying the replacement parts and timing associated with an improvement program. The engineering department can create a planning bill for engineering changes without modifying the parts manual file.

Detailed Description Text (45):

The Spares Inventory Management Subsystem 6 controls the ordering of spare parts. According to the invention, generic items such as nuts, bolts and washers, are reordered using a typical "order point" technique. In other words, when the quantity on hand falls below a predetermined order point, a replacement order is generated for a standard order quantity.

Detailed Description Text (46):

Replaceable parts are managed using time-phased requirement techniques. The planning cycle consists of three steps. First, the time-phase parts requirements are calculated. These requirements come from three sources: parts required to support time-phased maintenance requests, parts defined on planning bills and anticipated parts replacement due to parts exceeding the mean-time failure rate. Anticipated parts replacement takes the current production plan for each complex and extends the plan through the hierarchical description in the automated parts manual. The planned run hours for each week are added to the actual run hours. A requirement is then created to replace the part during the week in which it will exceed the mean-time failure rate and the accumulated run hours are set to zero for that week. This yields the anticipated replacement requirements of all complexes which is summed to derive the total time-phased replacement requirements for the part. The time-phased requirements consumes the on-hand inventory until it is depleted. Spare parts used to support unplanned maintenance are removed from the on-hand inventory when the spare parts are issued. Replacement of these spare parts may cause the system to order them sooner than originally planned.

Detailed Description Text (47):

Finally, a replacement order is created for each week in which requirements exceed the on-hand balance, or safety stock, if one is maintained. The replacement order may be released to the supplier a predetermined number of days prior to when the part is required, based upon the lead-time that the vendor requires to ship the part. All spare parts required to support the maintenance requests, planning bills and replacement parts are combined to determine the total amount to be ordered for each spare part. The system may also generate paper order forms for the parts, or

may electronically order the parts.

Detailed Description Text (63):

Referring to FIG. 7, the time dependent maintenance requests are generated at Block 44 by reading the Regularly-Scheduled (RS) file (Block 41). This file contains a RS record for each type of time dependent event to be performed on each piece of equipment. These events may require that the equipment be down - oil changes, lubrication or belt replacement. Other events perform visual inspection and equipment analysis while the equipment is still running. The measurement record is read for each RS record at Block 42 to extract the time interval that this event is to take place (Block 43). A planned maintenance request is created at Block 44 for each time dependent event during the first 52 weeks of the planning horizon.

Detailed Description Text (91):

The operator may then select the next piece of equipment to look at. As shown in FIG. 10A, the packer was selected and display of FIG. 10B is displayed. The packer has eight sections. An image of each is displayed on the left side of the display of FIG. 10B. The upper right corner includes a list of the parts. The lower right corner contains the above described "help", "exit", and "explode bill" option described above. Options also allow detail information (such as company part number, type of part or replacement history) to be displayed, allows return to a higher level in the hierarchy, allows an image to be printed, or a new assembly to be specified.

Detailed Description Text (92):

When the maintenance operator selects option 1 - FRAME SECTION 1" the computer reveals the next level of the machinery shown in FIG. 10C. When the maintenance operator selects option 1-part 0051, the last assembly of this sector appears on the computer along with the parts list (FIG. 10D). This is the lowest level in the hierarchial listing of parts. The maintenance operator may select the parts which are required by placing a 'P' beside the parts displayed. The parts will be automatically ordered, assigned an emergency maintenance request number, unless this is a planned modification, and the Parts Manual File will be updated to reflect the replacement parts. The Parts Manual Management Subsystem cooperates with the Spares Inventory Management System, as described below, to review part availability and to automatically issue the requested parts. The Parts Manual Management Subsystem also cooperates with the Maintenance Schedule Management System described above. All planned and unplanned maintenance requests are implemented through the Parts Manual Management Subsystem.

Detailed Description Text (99):

Engineering change control is divided into two phases. Identifying a change and coordinating the engineering change with the Parts Manual File is the first phase. Closing the engineering change and applying the change to the Parts Manual File is the second phase. Referring now to FIG. 11, in the first phase, all permanent modifications to the Parts Manual File (Block 108) are applied to the master copy and distributed to the plants (Block 111) upon ECN completion. Requests for modification come from several sources: 1) Maintenance Improvement Committee/vendor directives (Block 101) - such as equipment design changes for an efficiency upgrade; (2) Plant engineering modifications (Block 102) - implementing improvement suggestions from the maintenance operators; (3) Spare Part Inventory Control (Block 103) - for part substitution and replacements; and (4) Emergency maintenance performed (Block 104).

Detailed Description Text (101):

A new part added to the Parts Manual File is classified as "inactive" and will not appear on the Parts Manual File until an engineering change number is assigned. A part to be removed will be flagged as such when the engineering change number is assigned. A replacement part is a two step operation: (1) remove the current part to be replaced; (2) add the replacement part.

Detailed Description Text (103):

FIG. 12 shows two examples of Engineering Change Control (FIG. 11, Block 106) and updating the Parts Manual (FIG. 11, Block 108). The first example in FIG. 12 is for drawing number 0051.01. Engineering Change Number 1010 indicates that this drawing is to be deleted (1010D) and replaced by 0051.01.01 (1010A) on 2/10/XX. Drawing number 0051.01 will be used prior to 2/10/XX. Drawing 0051.01.01 will be used beginning 2/10/XX. The second example in FIG. 12 is for a part replacement. The distributor 4030 will be replaced by 4030.01 on 2/5/XX, controlled by Engineering Change Number 1011. Distributor 4030 is to be used before 2/5/XX (1011D). Distributor 4030.01 will be used beginning 2/5/XX (1011A). FIG. 13 shows the parts lists in effect on 2/5/XX.- FIG. 14 shows the same parts lists in effect on 2/10/XX. The parts list in FIGS. 12, 13 and 14 represent three different parts lists over a period of time based on the criteria of each engineering change number.

Detailed Description Text (125):

Next, referring to FIG. 24, the engineering change control entries are created. ECN 123--Group PM schedule--is date controlled (Block 175) to go into effect on 2/15/xx. ECN 456 is coded as a vendor part replacement to be implemented when Part-F is depleted (Block 173). This requires that Part-F be in the part master file (Block 176) and that the inventory quantity on-hand be greater than 0 (Block 177), plus any reserved stock if desired. ECN 789 is to implement a MIC improvement (Block 172) modification and will be effective when MR123 is completed. ECN 886 is another part use-up (Block 173). This one replaces one XYZ part with another XYZ part. This is the only ECN implemented through the part master.

Detailed Description Text (137):

If the part is under ECN control (Block 222), a part under XYZ use-up control (Block 223) updates the part master (Block 229) by moving the substitute/replacement XYZ part number into the XYZ part number field. The ECN is then closed (Block 230) and removed from the ECN file. The process then ends (Block 231).

Detailed Description Text (148):

Replaceable parts, such as fans, motors, shafts and drives, are those spare parts which have an extended life but which can break. These items have a mean-time failure rate which is initially rated by the vendor. The vendor normally supplies these parts. Posting the actual run hours to these parts and accumulating the future run hours provides the ability to compare the run hours to the mean-time failure rate and time-phase projected parts replacement.

Detailed Description Text (149):

In general, Spares Inventory Management Subsystem 8 manages the purchasing of spare parts in the following way: Non-stocked parts are purchased upon request. Generic parts are reordered using typical "Order Point" techniques. In other words, when the quantity on-hand falls below the predetermined order point, a replacement order is placed for a predetermined order quantity. Consumable and replaceable parts are managed using a time-phased requirements technique. This time-phased technique will now be described.

Detailed Description Text (153):

Each spare part classified as "consumable" or "replaceable" has a mean-time failure rate. The mean-time failure rate is the number of run hours at which this part is likely to fail or need replacement. Each part accumulates their actual run hours--stored in the cumulative run hours field. The planned run hours for each week are also accumulated for these parts. The planned run hours are added to the actual run hours. The results are compared to the mean-time failure rate. A requirement for the part is created each time the planned run hours exceeds the mean-time failure rate.

Detailed Description Text (155):

Replacement parts which are still under warranty by the vendor are listed for warranty replacement. The vendor's warranty date and/or warranty hours are maintained for the warranty comparison.

Detailed Description Text (169):

(3) Each week that the projected cumulative run hours exceed the mean-time failure rate, a replacement part is required. The projected cumulative run hours is reset by subtracting the mean-time failure rate for the projected cumulative run hours.

Detailed Description Text (189):

Referring again to FIG. 30, at Block 283, the part is checked for ECN use-up control. If the part is to be phased out (replaced) when it is used-up, the remaining requirements for this part must be posted to the substitute part (Block 284). FIG. 34 shows this example. Part 01B16 Part-F is under control of ECN 456-- use-up to be replaced by 01B15 Part-E. The first time the projected on-hand goes negative (-3) for this part (Part-F) is week 5 (Block 285). The remaining requirements for week 5 (-3) and all future requirements for this part are posted to the replacement part (01B15 Part-E) at Block 286. The replacement part is at least one planning level lower than the current planning level. This insures that the remaining requirements for this part are included in the requirements for the replacement part. This technique is used for planning purposes only. The ECN will go into effect when the last part is actually issued from spares.

Detailed Description Paragraph Table (1):

| Part Number | Vendor drawing number or Vendor part number from vendor parts catalog | Description | Vendor description | Status | A - active | I - inactive | O - obsolete | Image Address | Physical location of the image of the engineering drawing in the parts image file | Date Last Chg | Date that the image was last modified | XYZ Part Nbr | Unique internal company part number for this part. Different vendor part numbers may use the same internal company part. Substitute/ The internal part number <u>Replacement</u> which will replace the XYZ part nbr current internal part during material use-up. ECN nbr. Engineering Change Number authorizing this change. ECN Action | S - the substitute/ <u>replacement</u> internal part number will replace the current XYZ part number | R - the internal part number will replace this substitute/ <u>replacement</u> internal part number | Complexes List of complexes which this used in assembly appears in | Low Level | Lowest level number in the parts list file which this part appears | Planning | The planning level for this part. Used during spare parts planning. |
|-------------|---|-------------|--------------------|--------|------------|--------------|--------------|---------------|---|---------------|---------------------------------------|--------------|---|--|--|--|-----------|--|----------|---|
| | | | | | | | | | | | | | | | | | | | | |

Detailed Description Paragraph Table (3):

| Nbr | ECN | ECN-Criteria | DT - implementation date | VU - vendor part <u>replacement</u> inventory use-up | RU - internal part <u>replacement</u> inventory use-up | MR - maintenance request which will implement this change | ECN description |
|-----|-----|--------------|--------------------------|--|--|---|-----------------|
| | | | | | | | |

CLAIMS:

13. The computer integrated maintenance system of claim 12 wherein said electronically stored parts manual further includes a replacement part number for selected ones of the parts.

34. The computer integrated manufacturing and maintenance system of claim 33 wherein said electronically stored parts manual further includes a replacement part number for selected ones of the parts.

55. The computer integrated maintenance method of claim 54 wherein said generating step further comprises the step of generating an electronically stored parts manual

including a replacement part number for selected ones of the parts.

76. The computer integrated manufacturing and maintenance method of claim 75 wherein said generating step further comprises the step of electronically stored parts manual which includes a replacement part number for selected ones of the parts.

85. A computer integrated maintenance system for use with a computer integrated manufacturing system, the computer integrated manufacturing system including a computer controller for controlling a plurality of production complexes each of which includes a plurality of production machines, the manufacturing system computer controller including an electronically stored master schedule file having therein a schedule of actual production and planned production for the plurality of complexes, the manufacturing system computer controller controlling the plurality of production machines based upon the planned production in the master schedule file, said computer integrated maintenance system comprising:

an electronically stored parts manual, containing a hierarchical listing of parts in the plurality of production machines in the plurality of production complexes;

maintenance operations computer controlling means, adapted to be communicatively connected to the manufacturing system computer controller, and communicatively connected to the electronically stored parts manual, said maintenance operations computer controlling means comprising:

maintenance schedule management means, for identifying parts in the hierarchical listing to be maintained during a predetermined time period based upon the planned production in the master schedule file, and for scheduling maintenance activities for the identified parts to reduce disruption of production;

engineering change control management means, for integrating engineering change control activities into the scheduled maintenance activities;

parts manual management means, for updating the hierarchical listing in response to maintenance activities and engineering change control activities; and,

spares inventory management means, for generating requirements to order replacement parts for the identified parts to be available for use in the scheduled maintenance activities.

87. The computer integrated maintenance system of claim 85 wherein said maintenance schedule management means identifies parts to be maintained during the predetermined time period based upon one of projected use or the elapsed time since last replacement.

90. The computer integrated maintenance system of claim 85 wherein said hierarchical listing of parts in said electronically stored parts manual comprises a plurality of parts levels from a lowest level to a highest level, and wherein each part in the lowest level is identified as being one of a consumable part which is consumed by the production process, a replaceable part which has an extended life but is subject to wear or failure, a generic part which is a common part used in large numbers on many of the production machines, and a non-stocked part which does not normally require replacement.

92. The computer integrated maintenance system of claim 91 wherein said electronically stored parts manual further includes a replacement part number for selected ones of the parts.

97. The computer integrated maintenance system of claim 85 further comprising:

an electronically stored spares inventory file for identifying generic parts used in said plurality of production machines and replaceable parts used in said plurality of production machines; and

said spares inventory management means further comprising means for generating requirements to order a generic part when an inventory quantity falls below a predetermined quantity and for identifying requirements to order a replacement part to be available for use in the scheduled maintenance activities.

98. A computer integrated manufacturing and maintenance system for controlling manufacturing and maintenance of a plurality of production complexes each of which includes a plurality of production machines, said computer integrated manufacturing and maintenance system comprising:

an electronically stored master schedule file having therein a schedule of actual production and planned production for the plurality of complexes;

means for controlling the plurality of production machines based upon the planned production in the master schedule file;

an electronically stored parts manual, containing a hierarchical listing of parts in the plurality of production machines in the plurality of production complexes;

maintenance schedule management means, for identifying parts in the hierarchical listing to be maintained during a predetermined time period based upon the planned production in the master schedule file, and for scheduling maintenance activities for the identified parts to reduce disruption of production;

engineering change control management means, for integrating engineering change control activities into the scheduled maintenance activities;

parts manual management means, for updating the hierarchical listing in response to maintenance activities and engineering change control activities; and,

spares inventory management means, for generating requirements to order replacement parts for the identified parts to be available for use in the scheduled maintenance activities.

100. The computer integrated manufacturing and maintenance system of claim 98 wherein said maintenance schedule management means identifies parts to be maintained during the predetermined time period based upon projected use or the elapsed time since last replacement.

103. The computer integrated manufacturing and maintenance system of claim 98 wherein said hierarchical listing of parts in said electronically stored parts manual comprises a plurality of parts levels from a lowest level to a highest level, and wherein each part in the lowest level is identified as being one of a consumable part which is consumed by the production process, a replaceable part which has an extended life but is subject to wear or failure, a generic part which is a common part used in large numbers on many of the production machines, and a non-stocked part which does not normally require replacement.

105. The computer integrated manufacturing and maintenance system of claim 104 wherein said electronically stored parts manual further includes a replacement part number for selected ones of the parts.

110. The computer integrated manufacturing and maintenance system of claim 98 further comprising:

an electronically stored spares inventory file for identifying generic parts used

in said plurality of production machines and replaceable parts used in said plurality of production machines; and

said spares inventory management means further comprising means for generating requirements to order a generic part when an inventory quantity falls below a predetermined quantity and for identifying requirements to order a replacement part to be available for use in the scheduled maintenance activities.

123. The computer integrated maintenance system of claim 122 wherein said electronically stored parts manual further includes a replacement part number for selected one of the parts.

144. The computer integrated maintenance method of claim 143 wherein said generating step further comprises the step of generating an electronically stored parts manual including a replacement part number for selected ones of the parts.

153. A compute integrated maintenance system for a complex including a plurality of machines used to perform a primary function and which also require maintenance; said computer integrated maintenance system comprising;

an electronically stored parts manual, containing a hierarchical listing of parts in the plurality of machines in the complex;

maintenance operations computer controlling means, communicatively connected to the electronically stored parts manual, said maintenance operations computer controlling means comprising:

maintenance schedule management means, for identifying parts in the hierarchical listing to be maintained during a predetermined time period based upon a planned use schedule for the machines, and for scheduling maintenance activities for the identified parts to reduce loss of use of the complex;

engineering change control management means, for integrating engineering change control activities into the scheduled maintenance activities;

parts manual management means, for updating the hierarchical listing in response to maintenance activities and engineering change control activities; and,

spares inventory management means, for generating requirements to order replacement parts for the identified parts to be available for use in the scheduled maintenance activities.

155. The computer integrated maintenance system of claim 153 wherein said maintenance schedule management means identifies parts to be maintained during the predetermined time period based upon one of projected use or the elapsed time since last replacement.

158. The computer integrated maintenance system of claim 153 wherein said hierarchical listing of parts in said electronically stored parts manual comprises a plurality of parts levels from a lowest level to a highest level, and wherein each part in the lowest level is identified as being one of a consumable part which is consumed by the machine, a replaceable part which has an extended life but is subject to wear or failure, a generic part which is a common part used in large numbers on many of the machines, and a non-stocked part which does not normally require replacement.

160. The computer integrated maintenance system of claim 159 wherein said electronically stored parts manual further includes a replacement part number for selected ones of the parts.

165. The computer integrated maintenance system of claim 153 further comprising:

an electronically stored spares inventory file for identifying generic parts used in said plurality of machines and replaceable parts used in said plurality of machines; and

said spares inventory management means further comprising means for generating requirements to order a generic part when an inventory quantity falls below a predetermined quantity and for identifying requirements to order a replacement part to be available for use in the scheduled maintenance activities.

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File: USPT

Dec 25, 2001

DOCUMENT-IDENTIFIER: US 6333790 B1

TITLE: Printing system wherein printer connected to one computer is managed by another computer over a network

Brief Summary Text (13):

A fourth printing system in accordance with the present invention is characterized by a printing system which comprises a network, and a first computer, a second computer, and a printer connected to the network, wherein the first computer instructs the printer to print. The printer is composed of a printer controller and a printer engine, an updated program and data for the printer controller being registered and stored in the second computer. In the operation of this system, the second computer transmits information for proposing updating of a program and data of the printer to the printer controller; and the printer controller transmits the proposal information to the first computer. The first computer transmits updating request information for requesting an update of the program and the data to the printer controller; and the printer controller transmits the updating request information to the second computer. The second computer reads the requested program and the requested data, and then transmits the requested program and the requested data to the printer controller. The printer controller receives and stores the program and the data, and then transmits updating completion information concerning the program and the data to the first computer. The first computer notifies a user of completion of updating by displaying updating completion information on a screen using a user interface. The user of the first computer, having been notified of the completion of updating by the updating completion information, transmits a document to the printer; and the printer then performs printing of the document using the updated program and the updated data.

Brief Summary Text (14):

A fifth printing system in accordance with the present invention is characterized by a printing system which comprises a network, and a first computer, a second computer, and a printer connected to the network, wherein the first computer instructs the printer to print. The printer is composed of a printer controller and a printer engine, an updated program and updated data for the first computer being registered and stored in the second computer. In the operation of this system, the second computer transmits information for proposing updating of a program and data for the first computer to the printer controller. The printer controller then transmits the proposal information to the first computer. The first computer then transmits updating request information for requesting an update of the program and the data for the first computer to the printer controller; and the printer controller transmits the updating request information to the second computer. The second computer reads the requested program and the requested data, and then transmits the requested program and the requested data to the printer controller. The printer controller receives and stores the program and the data, and transmits the program and the data to the first computer. The first computer receives and stores the program and the data for the first computer and then notifies a user of completion of updating by displaying updating completion information on a screen using a user interface. The user of the first computer, having been notified of the completion of updating by the updating completion information, instructs the

printer to print using the updated program and the updated data.

Brief Summary Text (15):

A sixth printing system in accordance with the present invention is characterized by a printing system which comprises a network, and a first computer, a second computer, and a printer connected to the network, wherein the first computer instructs the printer to print. The printer is composed of a printer controller and a printer engine, an updated program and data for the first computer being registered and stored in the second computer. In the operation of this system, the second computer transmits information for proposing updating of a program and data for the first computer to the first computer; and the first computer transmits updating request information for requesting an update of the program and the data for the first computer to the second computer. The second computer reads the requested program and the requested data, and then transmits the requested program and the requested data to the first computer. The first computer receives and stores the program and the data for the first computer and then notifies a user of completion of updating by displaying updating completion information on a screen using a user interface. The user of the first computer, having been notified of the completion of updating by the updating completion information, instructs the printer to print using the updated program and the updated data.

Detailed Description Text (50):

The printer controller 2120 receives information on the occurrence of trouble in the printer engine 2200 and the contents thereof (process 701). As the receiving method, there are a method in which the printer engine 2200 actively reports to the printer controller 2100 and a method in which the printer controller 2100 periodically monitors the status of the printer engine 2200. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (51):

Then, the first computer 300 receives information on the occurrence of trouble in the printer engine 2200 and the identification of the trouble from the printer controller 2100 (process 702). As the receiving method, there are a method in which the printer controller 2100 actively reports to the first computer 300 and a method in which the first computer 300 periodically monitors the status of the printer controller 2100. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (59):

The printer engine 2200 monitors and stores the status of consumable articles used in printing while performing printing processing. In a case where the printer mechanism is of an electrophotographic type, the consumable articles are paper, toner, the photosensitive drum, cleaner, and so on. In a case where the printer mechanism is of an ink jet type, the consumable articles are paper and ink. In a case where the printer mechanism is of the shuttle impact type, the consumable articles are paper and a ribbon.

Detailed Description Text (60):

The printer controller 2100 receives a signal indicating the status of consumable articles in the printer engine, and stores the status of consumable articles in the individual printer information DB part (process 801). As the receiving method, there are a method in which the printer engine 2200 actively reports to the printer controller 2100 and a method in which the printer controller 2100 periodically monitors the status of the printer engine 2200. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (61):

Then, based on the contents of the individual printer information DB part 2121 in the printer controller 2100, the first computer 300 receives information indicating a shortage of consumable articles in the printer engine 2200 from the printer

controller 2100 (process 802). As the receiving method, there are a method in which the printer controller 2100 actively reports to the first computer 300 and a method in which the first computer 300 periodically monitors the status of the printer controller 2100. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (66):

After that, the printer controller 2100 forwards the information on the completion of acceptance of the order and the accompanying information to the first computer 300 (process 807). The first computer 300 displays the information on the completion of acceptance of the order and the accompanying information on a screen of a display to notify the user placing the order concerning the received information.

Detailed Description Text (70):

The printer engine 2200 monitors and stores the operating status of printing while performing printing processing. In regard to the operating status, the period of use, the spent quantity, the remaining quantity, and the occurrence of a shortage in each of the consumable articles, the preceding exchanged time, average lifetime, period of use, number of occurrence of troubles and failures, history of occurrence of troubles and failures, and so on are monitored. These conditions relate to the contents shown in FIG. 10.

Detailed Description Text (71):

The printer controller 2100 receives information on the operating status (hereinafter, referred to simply as operating status information) of the printer engine 2200, and stores the information in the individual printer information DB part (process 901). The contents stored are the information 10A, 10B, 10C, 10D, 10E of FIG. 10. As the receiving method, there are a method in which the printer engine 2200 actively reports to the printer controller 2100 and a method in which the printer controller 2100 periodically monitors the status of the printer engine 2200. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (72):

Then, based on the contents of the individual printer information DB part 2121 in the printer controller 2100, the second computer 400 receives the operating status information in the printer from the printer controller 2100 (process 902). As the receiving method, there are a method in which the printer controller 2100 actively reports to the second computer 400 and a method in which the second computer 400 periodically monitors the status of the printer controller 2100. Either of the methods may be employed, or both of them may be used together.

Detailed Description Text (75):

Then, the first computer 300 transmits information concerning an order for the replacement part to the printer controller 2100 in order to place an order for the part which is in its replacement time (process 905). The order is placed at the time when the user of the first computer 300 finds the proposal information corresponding to the information of the process 904 on a screen of the first computer 300 or the like. Then, the printer controller 2100 forwards the contents of the order to the second computer 400 (process 906).

Detailed Description Text (77):

After that, the printer controller 2100 forwards the information on the completion of acceptance of the order and the accompanying information to the first computer 300 (process 909). The first computer 300 displays the information on the completion of acceptance of the order and the accompanying information on a screen of the display using the user interface to notify the user placing the order concerning the received information.

Detailed Description Text (87):

The printer controller 2100 in the printer 200 receives and stores the programs and data (process 1308). Then, the printer controller 2100 transmits information on completion of the updating of the programs and the data in the process 1308 and the accompanying information to the computer 300 (process 1309). The first computer 300 displays the information on the completion of the updating of the programs and the data and the accompanying information on a screen of the display using the user interface to notify the user requesting the updating. The user of the first computer having been informed of the completion of the updating by the information on the screen of the display transmits a document to the printer 200 in order to perform printing using the updated programs and the updated data. The printer 200, having been instructed to print, performs printing of the document using the updated programs and the updated data in the printer controller 2100 (process 1310).

Detailed Description Text (104):

The first computer 300 displays the information on the completion of updating of the programs and the data and the accompanying information on a screen of the display using the user interface to notify the user requesting the updating. The user of the first computer, having been informed of the completion of the updating by the information on the screen of the display, instructs the printer 200 to perform printing using the updated programs and the updated data (process 1510).

Detailed Description Text (121):

The first computer 300 receives the programs and the data, and updates and stores the programs and the data in the secondary memory device (process 1606). The first computer 300 displays the information concerning the completion of updating of the programs and the data and the accompanying information on a screen of the display using the user interface to notify the user requesting the updating. The user of the first computer, having been informed of the completion of the updating by the information on the screen of the display, instructs the printer 200 to perform printing using the updated programs and the updated data (process 1607).

CLAIMS:

5. A printing system comprising:

a network;

a first computer connected to the network;

a second computer connected to the network; and

a printer connected to the network;

wherein the first computer instructs the printer to print;

wherein the printer includes a printer controller and a printer engine;

wherein an updated program and updated data for the printer controller are registered and stored in the second computer;

wherein the second computer transmits a proposal for updating a program and data for the printer controller to the printer controller;

wherein the printer controller transmits the updating proposal to the first computer;

wherein the first computer transmits an updating request requesting updating of the program and the data for the printer controller to the printer controller;

wherein the printer controller transmits the updating request to the second computer;

wherein the second computer reads the updated program and the updated data stored in the second computer in response to the updating request, and then transmits the updated program and the updated data to the printer controller;

wherein the printer controller stores the updated program and the updated data;

wherein the printer controller transmits information on completion of updating of the program and the data to the first computer;

wherein the first computer notifies a user of the first computer of the completion of updating by displaying updating completion information on a screen using a user interface;

wherein the user of the first computer, having been notified of the completion of updating by the updating completion information, instructs the first computer to transmit a document to the printer; and

wherein the printer prints the document using the updated program and the updated data.

6. A printing system comprising:

a network;

a first computer connected to the network;

a second computer connected to the network; and

a printer connected to the network;

wherein the first computer instructs the printer to print;

wherein the printer includes a printer controller and a printer engine;

wherein an updated program and updated data for the first computer are registered and stored in the second computer;

wherein the second computer transmits a proposal for updating a program and data for the first computer to the printer controller;

wherein the printer controller transmits the updating proposal to the first computer;

wherein the first computer transmits an updating request requesting updating of the program and the data for the first computer to the printer controller;

wherein the printer controller transmits the updating request to the second computer;

wherein the second computer reads the updated program and the updated data stored in the second computer in response to the updating request, and then transmits the updated program and the updated data to the printer controller;

wherein the printer controller stores the updated program and the updated data, and then transmits the updated program and the updated data to the first computer;

wherein the first computer stores the updated program and the updated data;

wherein the first computer notifies a user of the first computer of completion of updating by displaying updating completion information on a screen using a user interface; and

wherein the user of the first computer, having been notified of the completion of updating by the updating completion information, instructs the printer to print using the updated program and the updated data.

7. A printing system comprising:

a network;

a first computer connected to the network;

a second computer connected to the network; and

a printer connected to the network;

wherein the first computer instructs the printer to print;

wherein the printer includes a printer controller and a printer engine;

wherein an updated program and updated data for the first computer are registered and stored in the second computer;

wherein the second computer transmits a proposal for updating a program and data for the first computer to the first computer;

wherein the first computer transmits an updating request requesting updating of the program and the data for the first computer to the second computer;

wherein the second computer reads the updated program and the updated data stored in the second computer in response to the updating request, and then transmits the updated program and the updated data to the first computer;

wherein the first computer stores the updated program and the updated data;

wherein the first computer notifies a user of the first computer of completion of updating by displaying updating completion information on a screen using a user interface; and

wherein the user of the first computer, having been notified of the completion of updating by the updating completion information, instructs the printer to print using the updated program and the updated data.

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